

# Benchmarking the provision of coronary artery surgery

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**L**engthening queues and deaths among patients on waiting lists for coronary artery bypass graft surgery (CABG) have repeatedly sparked professional and public concern since the problem first emerged in Canada during the late 1980s.<sup>1</sup> Although the risk of dying while awaiting CABG is very low,<sup>2</sup> patients carry myriad burdens — social, psychological and financial — when the relief of disabling cardiac symptoms is delayed.<sup>3</sup> Moreover, when waiting lists are long the condition of some patients in the elective queue will eventually destabilize, necessitating urgent intervention.<sup>4</sup> An inefficient vicious cycle sets in whereby more and more elective cases are unpredictably “bumped” to make way for cases that have become urgent. More generally, long waiting lists are signposts for a supply–demand mismatch, and immediately raise the question, Is the current level of service provision too low?

The existence of a queue does not in itself answer this question in the affirmative. Imagine, for example, a clinical service that was once in short supply, leading to long queues. Funding and capacity steadily increase, leading to a new equilibrium between supply and demand. The result would be a long but stable queue, persisting as an epiphenomenon of past problems rather than current shortfalls. Shortening the queue would require a one-time increase in throughput, not a fixed or recurrent increase in population-based rates of service.

On the other hand, if a queue for a given service is growing steadily, and if most patients in that queue will achieve clear-cut health benefits from that service, then there is a strong *prima facie* case for service expansion. This thinking underpins a fascinating article in this issue by Dr. George A. Fox and colleagues (page 1137), in which they benchmark the provision of CABG for Newfoundland and Labrador.

The authors apply explicit appropriateness criteria developed in 1991 by a Canadian expert panel.<sup>5</sup> Using the Delphi method developed by RAND Corporation, this panel rated hundreds of surgical indications representing different combinations and permutations of the clinical factors that determine the expected net benefits of CABG. Of 338 patients in Newfoundland and Labrador who underwent CABG in the fiscal year 1994–95, the team matched over 99% to surgical indications for which the panelists judged the net benefits sufficient to make the procedure worth while.

Because appropriateness ratings by expert panels assess the abstract potential for net benefit, they tend to err on the side of intervention. The Canadian expert panel accordingly had rerated each “appropriate” surgical indication on a “necessity” scale.<sup>5,6</sup> A high necessity rating for an indication would mean that failure to offer surgery to such patients might be regarded as malpractice. Fully 94% of the CABG cases assessed by Fox and colleagues met these more stringent criteria.

Having validated the clinical judgement of cardiologists and cardiac surgeons at their centre, the authors examined waiting times and patient throughput. They documented delays that exceeded detailed guidelines suggested by an Ontario expert panel,<sup>7</sup> and also found that whereas 391 patients were referred for surgery, only 338 underwent the procedure in 1994–95. This confirmed that there was growth in an already excessive queue of patients who would benefit from surgery. Fox and colleagues also assessed the patients undergoing angiography who had *not* been accepted for CABG and identified an additional 31 patients who met ne-



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cessity criteria for CABG. In other words, the situation had already gone beyond service delay to service denial.

The study's methods have some inherent limitations. Utilization criteria based on the deliberations of expert panels usually blend evidence with inference, melding facts and values without delineating the degree of net benefit expected for specific indications.<sup>8</sup> Panels from different countries or with differing representation from the specialties concerned may arrive at different verdicts for similar indications.<sup>9</sup> Indications given high necessity ratings are generally those for which surgery is expected to improve life expectancy. However, from a meta-analysis of randomized trials comparing early surgery to initial medical therapy, researchers have derived a model showing that the magnitude of life-expectancy gains from CABG has a complex relationship to multiple factors,<sup>10</sup> some of which were not considered at all by the Canadian expert panel.

That being said, the findings remain convincing. The provincial government has responded by agreeing to fund a level of CABG service provision that would accommodate all patients identified by angiography as meeting necessity criteria and to support additional shorter-term increases in throughput aimed at reducing waiting times.

If population-based benchmarking of CABG capacity is to continue in Newfoundland and Labrador, what other issues must be faced? For starters, as capacity expands and waiting times shrink, there will be an opportunity for better management of the CABG queue. Use of explicit queuing criteria can match priorities to need and limit vital risks. In Ontario, for example, we found that among 22 655 consecutive patients booked for isolated CABG between October 1991 and June 1995, 0.40% died while awaiting surgery; multivariate analysis showed that patients who waited longer than the maximum recommended time for their clinical profile had an increased risk of death in the queue (odds ratio 1.59; 95% confidence interval 1.01 to 2.51;  $p = 0.044$ ).<sup>11</sup>

There will also be questions about where current capacity has been fixed. By implication, the government proposes to deny surgery to patients who meet explicit appropriateness criteria but have a necessity score in the medium range. Can any government defend this position when so many other services are provided without explicit audits and controls?

Analyses in Ontario have shown for several years that, despite substantial expansion in overall capacity, residents of some regions are twice as likely to undergo CABG as others.<sup>12,13</sup> For the scattered population of Newfoundland and Labrador, regional equity may be even more difficult to achieve.

Benchmarking capacity on the basis of an appropriateness scale applied to patients after angiography begs the

question of whether the level of demand for CABG is itself appropriate. We do not know how high demand might rise in Newfoundland and Labrador if general practitioners referred more patients for noninvasive tests of ischemic jeopardy, and if internists and cardiologists in turn referred more patients for coronary angiography.

Unfortunately, it is very difficult to define benchmarks a priori. Modest interprovincial variations aside, Canada's overall population-based rate of CABG is much higher than rates in New Zealand and the UK, slightly higher than those in some European countries but lower than in others, and markedly lower than those in the US. Researchers have compared Canadian and American patients with coronary artery disease to determine whether more aggressive use of mechanical revascularization (both CABG and angioplasty) yields better patient outcomes.<sup>14-16</sup> American patients have come out ahead in studies that measured angina, functional status and health-related quality of life.<sup>14,15</sup> However, these observational comparisons are confounded by other factors, including the greater use of specialist care and of cardiac rehabilitation services in the US.

No study has demonstrated survival advantages, presumably because indications shift as capacity expands. For example, when all patients undergoing isolated CABG in Ontario and New York State during 1993 were compared using registry data,<sup>17</sup> only 6% of patients in Ontario versus 30% of patients in New York had limited coronary artery disease (1- or 2-vessel disease without proximal left anterior descending involvement). New York brought 17 times as many patients over the age of 75 to surgery with limited anatomical coronary disease. Even in comparisons across regions of Ontario, the proportion of CABG candidates without any expected survival benefit is significantly higher in hospitals servicing high-rate areas.<sup>18</sup> But while marginal survival gains from CABG appear to diminish with higher rates of service provision, quality-of-life benefits must also be considered. Reasonable people will accordingly agree to disagree about the "right" rate for CABG.

Although many difficult issues remain unresolved, the study by Fox and colleagues shows how systematic evaluation can simultaneously shed a positive light on clinical decision-making and make a convincing case for more public resources. There will, of course, be other occasions when evaluative studies show that the solution lies not in more funding but in better management and improved clinical decision-making. So be it. The public interest is well served in either case.

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